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ABSTRACT

Observation has suggested that different subgroups of precocious readers might be distinguished by different patterns of strengths and weaknesses. In particular, it seems that one group of children might be distinguished by the strength of their top-down, conceptually driven processes and another by their strong bottom-up, text driven processes. To determine if these impressions of precocious readers' strategies provide a valid description of more than a few cases, 87 teacher-designated precocious readers at the kindergarten level were studied. The children completed a reading comprehension test; tests of reading, verbal ability, and short term memory; and a battery of oral reading measures. In addition, their parents completed questionnaires describing the reading histories and reading habits of their children. Results indicated that precocious readers were especially adept at tasks that drew on processes above the individual word level. However, any generalizations about this group must be tempered by consideration of individual differences within the group. (FL)

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The Structure of Precocious Reading Ability

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The Structure of Precocious Reading Ability

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Given the enormous amount of effort that has been devoted to the study of individual differences in beginning reading, it is remarkable how little we know about the most successful beginning readers, those who have attained substantial comprehension ability even before beginning first grade. Furthermore, virtually all of the few studies that have been done have been limited to descriptions of precocious readers' general intelligence and family backgrounds and of the kinds of help they have received from their parents (Durkin, 1966; Torrey, 1979).

One critical kind of information that has been missing from all of the previous research is descriptive information about the specific reading skills of precocious readers. Reading with comprehension is a highly complex skill, and our understanding of the full range of individual differences in beginning reading would be enhanced if we knew something about the component subskills of the most able. Are there certain things that precocious readers do better than children whose progress in learning to read has been less accelerated? Are there gaps in their skills for which they are compensating by drawing on other, better-developed subskills? Are precocious readers a homogeneous group, or is it possible to identify subgroups whose strengths and weaknesses lie in different kinds of subskills? Answers to questions like these should be extremely helpful in tracking down the necessary conditions for successful progress in beginning reading. If there are gaps or weaknesses in the skill patterns of these highly successful readers, a high degree of proficiency in those particular subskills may not be necessary for learning to read. If there are subskills that are particularly well

developed among precocious readers, these skills may be important ones to foster among less successful learners.

My initial, informal experiences with precocious readers of preschool age suggested to me that these children might indeed be using strengths in some skill areas to compensate for weaknesses in other areas. It also seemed that different subgroups of precocious readers might be distinguished by different patterns of strengths and weaknesses. In particular, observation of these children suggested that one group of children might be distinguished by the strength of their top-down, conceptually-driven processes and another by their strong bottom-up, text-driven processes. Some of the children I observed seemed to do a good deal of guessing from context, reading fluently and with high levels of comprehension despite what appeared to be a limited ability to use grapheme-phoneme correspondence rules. Other children clearly had mastered decoding rules at a very early age; they seemed able to decode any text whether or not they could understand what they were reading.

In order to determine whether these informal impressions of precocious readers' strategies provided a valid description of more than a few selected cases, we needed to generate a large sample of precocious readers. Although we would have liked to work with children of preschool age, the only economically feasible strategy was to sample precocious readers who were in their kindergarten year at local public schools. Our sample was generated by asking kindergarten teachers in five Seattle-area suburban school districts to nominate any children who seemed to be reading at or above the third grade level. Teachers were given a passage from a third grade basal reader that they could use to help make that judgment, but they were also asked to nominate any child who seemed to meet our general criterion. We phrased our instructions to encourage teachers to use a liberal selection criterion and over- rather than under-nominate children. We also avoided specifying whether we were looking for good comprehenders or good decoders. Parents of nominated children contacted us, and we worked with a total sample of 97 children whose comprehension grade-equivalent scores on the Peabody Individual Achievement Test (PIAT) ranged from the second to the fifth grade level.

All children were tested in individual sessions during the summer following their kindergarten year. The tasks we administered are listed in Table 1. Each session began with administration of the PIAT reading comprehension subtest, which requires the child to read a sentence or two silently, then point to whichever of four pictures best illustrates the text. Selected subtests from the WISC-R were administered to give us estimates of the children's verbal and spatial reasoning ability and short-term memory. (The digit span subtest was not administered to the 34 children tested during the first of the two summers during which we collected data.) After completing these preliminary tasks and taking a short break, the children were introduced to a second examiner who administered a battery of oral reading tasks. The children's performance on this oral battery was tape recorded and later transcribed, using phonemic coding as necessary. Acceptable levels of inter-rater reliability were established for the scoring of all measures. With a few exceptions which are noted on the tables and figures, the results I am reporting today are based on 87 cases for whom we had usable data on all of the measures we wished to include in our central analyses. At the time they were tested, the children ranged in age from 66 to 83 months, with a mean age of 76.9 months.

While the children were working, we asked their parents to complete questionnaires describing the children's reading histories and current reading habits. As others have found in previous studies of precocious readers (e.g. Durkin, 1966), virtually all of the children had received some sort of help from their parents in learning to read. In some cases, this was professional help. Of 78 cases for which we have this information, 19 children had a parent with training in elementary education. Although the children in our sample had received help in reading at home, only 6% had received any formal training in phonics or decoding at preschool. Some sort of preschool instruction in pre-reading skills such as letter identification was reported by 40% of the parents, but many of these parents noted that the preschool activities addressed skills their children had mastered some time before.

Parents' reports indicated that one quarter of the children had received no special attention during their kindergarten year. These children had participated in the pre-reading lessons given to the class as a whole. Another quarter of the children had been given opportunities for independent reading in class and for trips to the library. The second half of the sample had received some special instruction within their own classes or in individual sessions with a reading specialist. We have not yet tried to determine whether these different experiences might be related to individual differences in the children's reading skills.

Turning to consideration of the children's actual reading skills, our first question is whether these precocious readers, as a group, tended to be particularly strong or weak in different skill areas. The group's mean comprehension ability was at the late third grade level (mean PIAT G.E.=3.8). Therefore, we might expect them to be functioning at the same level on other measures for which we could get comparative data. Since we were unable to test our own group of older average readers, we had to make such comparisons by drawing on data from previous samples to which some of the tasks in our battery had been administered.

The best comparative data we have are for measures of the speed with which the children could name letters, read word lists, and read text. Andrew Biemiller gave us access to the standardization data for his test (Biemiller, 1981) of letter, word, and text reading speed. The comparison of our precocious readers with the second and third graders from that standardization sample is depicted in Figure 1. As you can see from the right-hand set of columns in that figure, the precocious readers read text at a speed close to what would be expected from their comprehension level. Their performance on this task was midway between that of the second and third graders in the standardization sample. Since the test was standardized in the spring, this places the text reading speed of the precocious group at the beginning third grade level. However, the precocious group performed less well on the other two reading speed measures. Their word list reading speed was the same as that of the second

graders, and they were substantially slower than the second graders in naming a list of lower-case letters. All of these group by task interactions were highly significant.

The reading speed data indicate that precocious readers are reading text more fluently and comprehending it better than one would predict from the efficiency of their letter and word identification. The data from another of our tasks show a similar pattern. Our measures of word reading accuracy were taken from a study published by Jonathan Baron (1979). Baron reported mean accuracy levels for various groups of children reading a list of phonetically regular words, a list of phonetically irregular or exception words, and a list of pseudowords that could be pronounced "correctly" by using regular grapheme-phoneme correspondence rules or by analogy to the exception words. Baron's data and our own are summarized in Table 2. Both the overall level of our group's performance and differences in performance across the three tasks are of interest. First, note that our precocious readers did not perform any better than Baron's group of second graders, a group he describes as coming from a typical urban public school class. Neither was their overall performance level dissimilar from that of a group of first graders selected from a program emphasizing instruction in phonics. Although Baron's groups are small and were not chosen to provide norms of any sort, these data seem consistent with the finding that the precocious readers were at the second grade level in their word identification ability. Thus we have two kinds of data suggesting that precocious readers are "over-achieving" in their comprehension, relative to their word identification ability.

The pattern of the precocious readers' performance across Baron's three tasks is also of interest. Both of Baron's groups of average or good readers tended to perform less well in reading exception words than in reading pseudowords to which they could apply grapheme-phoneme correspondence rules. As one would expect, the difference is particularly striking in the data for the group from the strong phonics program, but the same trend is evident in the data for the typical second graders.

In contrast, Baron's two groups of older poor readers were at least as good at reading real exception words as at reading pseudowords. Although the effect is a small one, we are intrigued by the fact that our precocious readers showed a pattern of performance more like that of Baron's poor readers than his better readers. Others have noted that poor readers tend to rely especially heavily on context-dependent processes to compensate for their weak decoding ability (e.g. Stanovich, 1980). The present data suggest that precocious readers may be doing the same sort of thing, and as a result perform well on a measure of ability to read words that must be learned as meaningful wholes.

We can also compare the precocious readers with less able groups in terms of their performance on a second pseudoword reading task, the Word-Attack subtest of the Woodcock-Johnson Psycho-Educational Battery (1977). Our group's mean raw score on that test was 11.0, approximately midway within the normative "instructional range" of grade levels 2.5 to 4.0. Individual raw scores ranged from 1 to 22, spanning the low first to superior twelfth grade levels. Since the Woodcock-Johnson pseudoword list is more difficult than Baron's, these findings may indicate that our group's second-grade-level performance on Baron's task was influenced by a ceiling effect. However, given that the maximum score for our group on Baron's pseudoword task was 34 out of a possible 36 and that three of Baron's four groups performed better than the precocious readers, we think a more likely explanation for this discrepancy is that the experience of completing the Baron pseudoword list, which was administered first to all children, may have provided practice sufficient to increase the precocious readers' scores on the Woodcock-Johnson by a few items. Also, the subtests of the Woodcock-Johnson were not intended to provide precise normative estimates of achievement levels.

In summary, comparisons of our precocious readers' performance with that of older average and poor readers suggest that precocious readers are especially adept at tasks which draw on processes above the individual word level. However, any generalizations about this group must be tempered by consideration of individual

differences in skill patterns within the group.

The results of our principal analysis of individual differences are summarized in Figure 2. The measures included in this analysis were chosen from the full set of possibilities because they were representative of the range of skills in which we were interested, because performance on them was variable and reliable, and because none of them were mathematically dependent on one another. Some of the descriptions of the measures at the bottom of Figure 2 are phrased a bit awkwardly because we reflected measures when necessary so that high scores would always mean good performance.

The LISREL V model depicted in Figure 2 is not the one we originally predicted. We had hoped to be able to account for variation in these measures by a model in which the measures numbered 1 through 5 would constitute one factor and those numbered 6 through 11 a second, independent factor. This is the model that would have been most consistent with my original impressions of the dimensions of difference among precocious readers. However, when we attempted a simple two-factor analysis, it was evident that even though the primary loadings of the measures were consistent with such a model, the two factors were strongly intercorrelated. It was also apparent that there were subsets of measures within both sets 1 through 5 and 6 through 11 that would form separate factors. The hierarchical model depicted in your figure is the best fitting of several alternatives. In defining all of these possible models, we stipulated that the specific factors must be independent of the higher-order general factor, but allowed the specific factors to correlate with one another.

As is evident in the factor loadings indicated on the diagram, all of the measures, except for absence of insertion errors, contribute substantially to the General factor. In other words, the precocious readers in this sample differed from one another rather consistently in their performance on this set of measures. As one might expect in a group ranging from the second to the fifth grade level in comprehension, some were

simply better oral readers than others. However, the existence of the three specific factors shows that within-group differences were not unidimensional. The nature of the measures loading on the Speed and Graphic Precision factors, their inverse correlation with one another, and their relations with the other measures listed in the correlation matrix in Table 3 all suggest that these two factors represent individual differences in reading style—fast and sloppy vs. slow and precise. The Decoding Rule Use factor is more interesting. This factor does not include all of the measures that involve reading words out of context. It represents only the ability to use grapheme-phoneme correspondence rules in decoding regular real words and pseudowords. It's existence indicates that precocious readers vary in this ability independently of their overall reading ability as represented in the General factor in this model or in their comprehension ability (see Table 3). Unlike General Ability and comprehension, Decoding Rule Use is not related to Verbal Ability. It is modestly related to backward digit span.

Dividing the precocious readers into subgroups based on whether their performance on the General and Decoding Rule Use factors was above or below the sample means for those factors yielded four roughly equal-sized subgroups, one of which is of particular interest because it is the group most discrepant with the general description of precocious readers as being relatively weak in decoding ability. Those children who had high Decoding Rule Use scores and low scores on the General factor were, as one might expect from the LISREL V diagram and the correlations in Table 3, relatively slow readers, poor at completing cloze passages and in reading the list of exception words. This subgroup was also relatively unlikely to make oral reading errors that were contextually constrained. They were low in Verbal Ability, letter naming speed, and comprehension.

In summary, it appears that our original hypotheses about the nature of individual differences among precocious readers were essentially correct. Our general description of these children as being relatively poor word readers and relatively good context users must be modified to allow for the existence of a subgroup with the opposite pattern of strengths. The existence of this minority was evident in a cluster analysis of subjects based on the individual reading skill, cognitive, and parent measures as well as in the LISREL V results.

The existence of a subgroup of especially strong decoding rule users suggests an intriguing parallel with another, very different, group of precocious readers. Although our sample consisted of children who, like the overwhelming majority of precocious readers, were reasonably bright and definitely normal in their intellectual development, precocious reading is also found occasionally among children who are seriously deficient in their cognitive and linguistic functioning and who show signs of neurological impairment. These children, who have been given the label "hyperlexic," have advanced ability to read words aloud, even though their comprehension of written material is limited to the modest level of their oral language comprehension. In a recent study of 12 such children, Healy (1982) found that they varied from good to extraordinary on a measure of pseudoword decoding ability. Healy's description of her sample suggests that the children also varied, and were often very good, in oral reading speed and graphic precision. In accordance with the definition of the hyperlexic syndrome, the children were consistently poor comprehenders. Thus it appears that the specific skill factors evident in our analysis may also be evident in the performance of a highly atypical group. The independence of these factors from comprehension and from verbal reasoning ability is not just a property of our sample and our set of measures. Our data and Healy's both suggest that advanced decoding rule use and rapid and precise text reading may have origins and implications independent of other aspects of reading skill.

Unfortunately, we do not know whether the pattern of individual differences within our group of precocious readers is similar to what one might find in a group of typical second or third graders. Perhaps this same pattern of skills would be evident in samples of typical readers drawn from an assortment of reading programs. It is also quite possible that the specific factors we found in our group would not be found in groups of typical readers. Remember that our pattern was not the commonly observed distinction between word decoding accuracy and comprehension, in which decoding is generally taken to be a necessary but not sufficient condition for comprehension.

Whatever the complete picture of similarities and differences between precocious and average readers ultimately is shown to be, the results of our study suggest to us that the study of precocious readers has revealed a new perspective on the relationship between various subskills and reading comprehension. Recent bottom-up or mostly bottom-up interactive models of beginning reading have stressed the prerequisite nature of word reading efficiency. Children who are not able to read isolated words accurately and rapidly and who must rely on context as an aid to decoding have been found to be poor comprehenders, with a poor prognosis for further development of comprehension ability (Lesgold & Resnick, 1982; Perfetti & Roth, 1981; Stanovich, 1980). However, the majority of our precocious readers seem to be in some ways similar to poor comprehenders. The critical difference is that when precocious readers rely on context-level processes to bolster their word identification skills, the process **works**. Perhaps precocious readers' advantage over other groups of inefficient decoders lies in their superior verbal knowledge. However, the performance of our group on three verbal subtests from the WISC-R was not, on the average, remarkably advanced. On all three subtests, average performance was about one standard deviation above the mean of the standardization sample. Only on the Similarities subtest was the precocious readers' performance more advanced than what would be expected of average second graders. Perhaps the critical factor is not verbal knowledge itself but precocious

readers' ability to use that knowledge effectively, actively and strategically compensating for gaps in their lower-order skills. Such a possibility is consistent with findings from other groups of gifted performers, such as those described on Tuesday by my colleague Earl Butterfield (Butterfield & Jackson, 1984; Jackson & Butterfield, in press). In general, gifted performers seem to be especially strong in their metacognitive (or executive) functions and to be able to solve problems effectively even when they have been given incomplete instruction.

We are of course aware that any conclusions we draw from our present data must be tentative ones. We need to confirm our present findings in a study which would permit better-controlled comparisons of the performance of precocious and average readers. In order to test our hypotheses about special characteristics of precocious readers' reading strategies, we will need to move beyond the descriptive measures of the present study to more focused and analytic measures of process components. Nonetheless, our present results clearly demonstrate the importance of further research with precocious readers. Furthermore, we feel confident that the results of this research will have important implications for understanding which component processes are universally prerequisite for learning to read and which are used differently by different groups of successful readers.

References

Baron, J. (1979). Orthographic and word-specific mechanisms in children's reading of words. Child Development, 50, 60-72.

Biemiller, A.J. (1981). Manual for the Biemiller Test of Reading Processes. Toronto: University of Toronto Guidance Centre.

Butterfield, E.C. & Jackson, N.E. (April 24, 1984). Paper presented in R. J. Sternberg (Chair), Conceptions of giftedness. Symposium presented at the annual convention of the American Educational Research Association, New Orleans.

Dunn, L.M. & Markwardt, F.C. (1970). Manual for the Peabody Individual Achievement Test. Circle Pines, MN: American Guidance Service.

Durkin, D. (1966). Children who read early. New York: Teachers College Press.

Healy, J.M. (1982). The enigma of hyperlexia. Reading Research Quarterly, 17, 319-338.

Jackson, N.E. & Biemiller, A.J. (1984). Letter, word, and text reading times of precocious and average readers. Manuscript under editorial review.

Jackson, N.E. & Butterfield, E.C. (in press). A conception of giftedness designed to promote research. In R.J. Sternberg & J.E. Davidson (Eds.), Conceptions of giftedness. New York: Cambridge University Press.

Joreskog, K.G. & Sorbom, D. (1981, November). LISREL V: Analysis of linear structural relationships by maximum likelihood and least squares methods. University of Uppsala Dept. of Statistics, S-75120 Uppsala, Sweden.

Lesgold, A.M. & Resnick, L.B. (1982). How reading difficulties develop: Perspectives from a longitudinal study. In J.P. Das, R.F. Mulcahy, & A.E. Wall (Eds.), Theory and research in learning disabilities. New York: Plenum.

Perfetti, C.A. & Roth, S.F. (1981). Some of the interactive processes in reading and their role in reading skill. In A.M. Lesgold & C.A. Perfetti (Eds.), Interactive processes in reading. Hillsdale, NJ: Erlbaum.

Stanovich, K.E. (1980). Toward an interactive-compensatory model of individual differences in the development of reading fluency. Reading Research Quarterly, 16, 32-71.

Stump, T.A. (1978). Cloze and dictation tasks as predictors of intelligence and achievement scores. In J.W. Oller, Jr. & K. Perkins (Eds.), Language in education: Testing the tests. Rowley, MA: Newbury House.

Torrey, J.W. (1979). Reading that comes naturally: The early reader. In T.G. Waller & G.E. MacKinnon (Eds.), Reading research: Advances in theory and practice. New York: Academic Press.

Wechsler, D. (1974). Manual for the Wechsler Intelligence Scale for Children-Revised. New York: Psychological Corp.

Woodcock, R.W. & Johnson, M.B. (1977). Woodcock-Johnson Psycho-educational Battery. Boston: Teaching Resources.

Table 1

List of Cognitive and Reading Tasks Administered

Peabody Individual Achievement Test: Reading Comprehension subtest (Dunn & Markwardt, 1970)

Wechsler Intelligence Scale for Children—Revised: Information, Similarities, Vocabulary, Block Design, Object Assembly, Digit Span subtests (Wechsler, 1974)

Biemiller Test of Reading Processes: letter, text passage, and word list reading speed (Biemiller, 1981)

Cloze passages with 20 blanks per passage (Stump, 1978)

Lists of regular words (e.g. fist), exception words (e.g. island), and pseudowords (e.g. islop) (Baron, 1979)

Woodcock-Johnson Psycho-educational Battery: Word Attack subtest (Woodcock & Johnson, 1977)

Four oral reading passages of graded difficulty, scored for time, errors, and retelling accuracy

Table 2

Mean (SDs) Correct Responses of Precocious Readers and Groups Studied by Baron (1979) in Reading Regular, Exception, and Pseudo-words (Max.=36 per list)

Group	Number Correct		
	Regular	Exception	Pseudowords
Precocious (N=87)	29.6 (4.6)	27.1 (5.7)	25.1 (5.6)
Baron Exp. 1, Poor Readers (N=20)	17.9 (7.5)	20.3 (6.7)	15.1 (8.3)
Baron, Learning Disabled 9-11 year olds (N=16)	32.1 (4.6)	27.3 (5.8)	26.7 (5.7)
Baron, Public School Second Grade (N=20)	30.9 (2.6)	26.0 (3.6)	29.4 (3.3)
Baron, First Graders Strong Phonics Program (N=14)	29.6 (5.3)	21.1 (6.5)	28.8 (3.7)

Source of Baron data: Baron, J. (1979) Orthographic and word-specific mechanisms in children's reading of words. Child Development, 50, 60-72.

Within the precocious group, the difference between the Exception and Pseudoword means is highly significant ($t(86)=3.17$, $p=.002$).

Table 3

Significant ($p \leq .05$) Product-moment Correlations between Reading Skills Factors and Cognitive and Reading Achievement Measures (N=87)

Variable	Variable 1	2	3	4	5	6	7	8	9	10	11
1. WISC-R Spatial Factor (M=0,SD=.80)		.33	.26							.24	
2. WISC-R Verbal Factor (M=0,SD=.80)	.33		.24	.39		.41				.32	
3. Letter Naming Speed (M=10.096,SD=.098)	.26	.24		.38		.44	.27			.21	.26
4. Forward Digit Span[a] (M=5.3,SD=1.6)		.39	.38		.26	.35			.29	.44	
5. Backward Digit Span[a] (M=3.7,SD=1.1)				.26			-.39	.28	.26		.24
6. General Ability (M=0,SD=.97)		.42	.44	.35						.47	.51
7. Speed (M=0,SD=.91)			.27		-.39			-.71	-.63		
8. Decoding Rule Use (M=0,SD=.85)					.28		-.71		.31		
9. Graphic Precision (M=0,SD=.86)				.29	.26		-.63	.31			
10. PIAT Comprehension (M=35.7,SD=5.8)	.24	.32	.21	.44		.47					.41
11. Text Retelling (M=1.80,SD=.64)			.26		.24	.51				.41	

Note. The estimates of LISREL-V factor scores used to generate this matrix yield biased estimates of the latent trait correlations in Figure 1. However, three different estimation procedures produced essentially the same estimates.

[a] N=56 for correlations involving these measures; values are reported for all r's large enough to be significant ($p \leq .05$) for N=87.

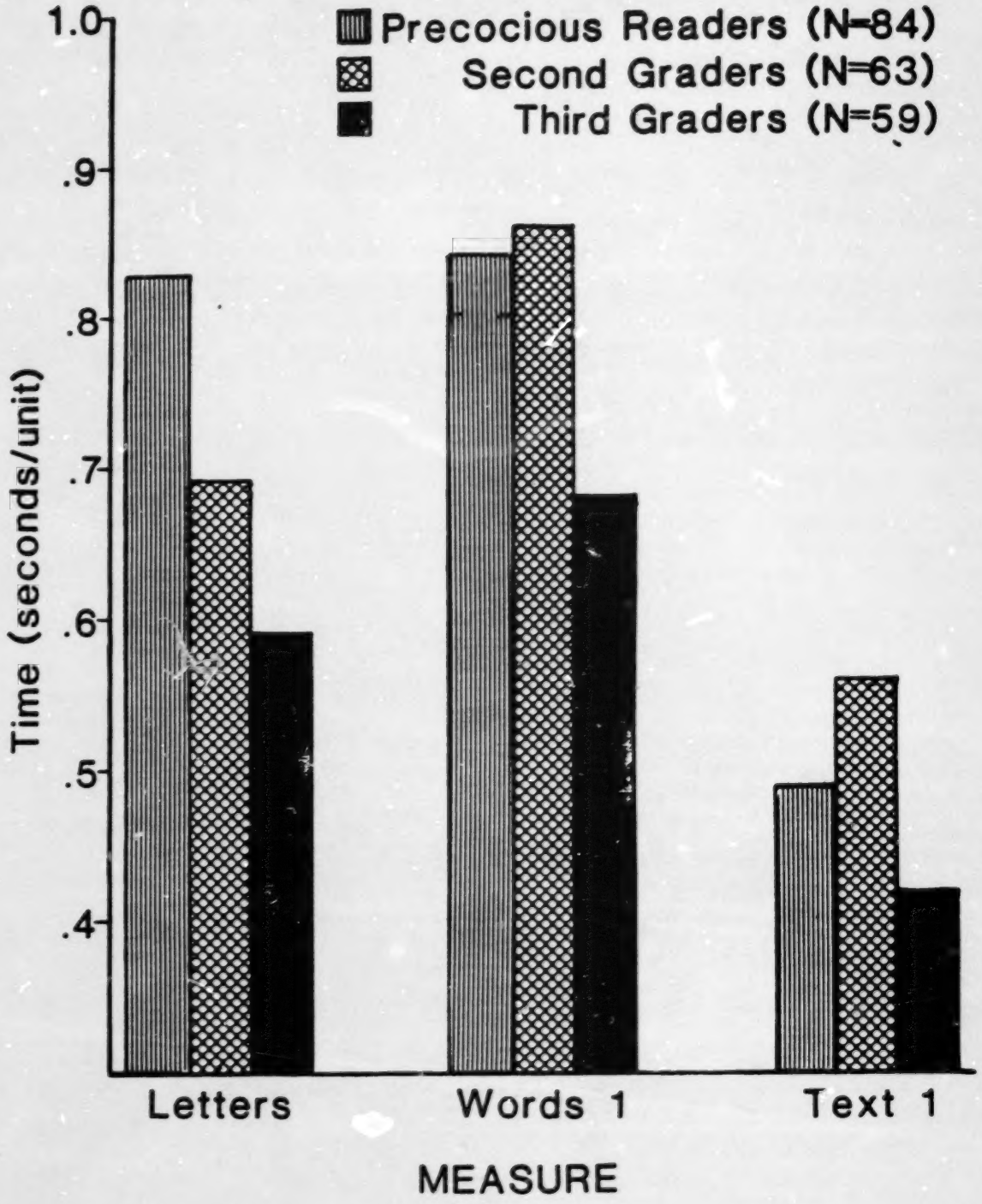
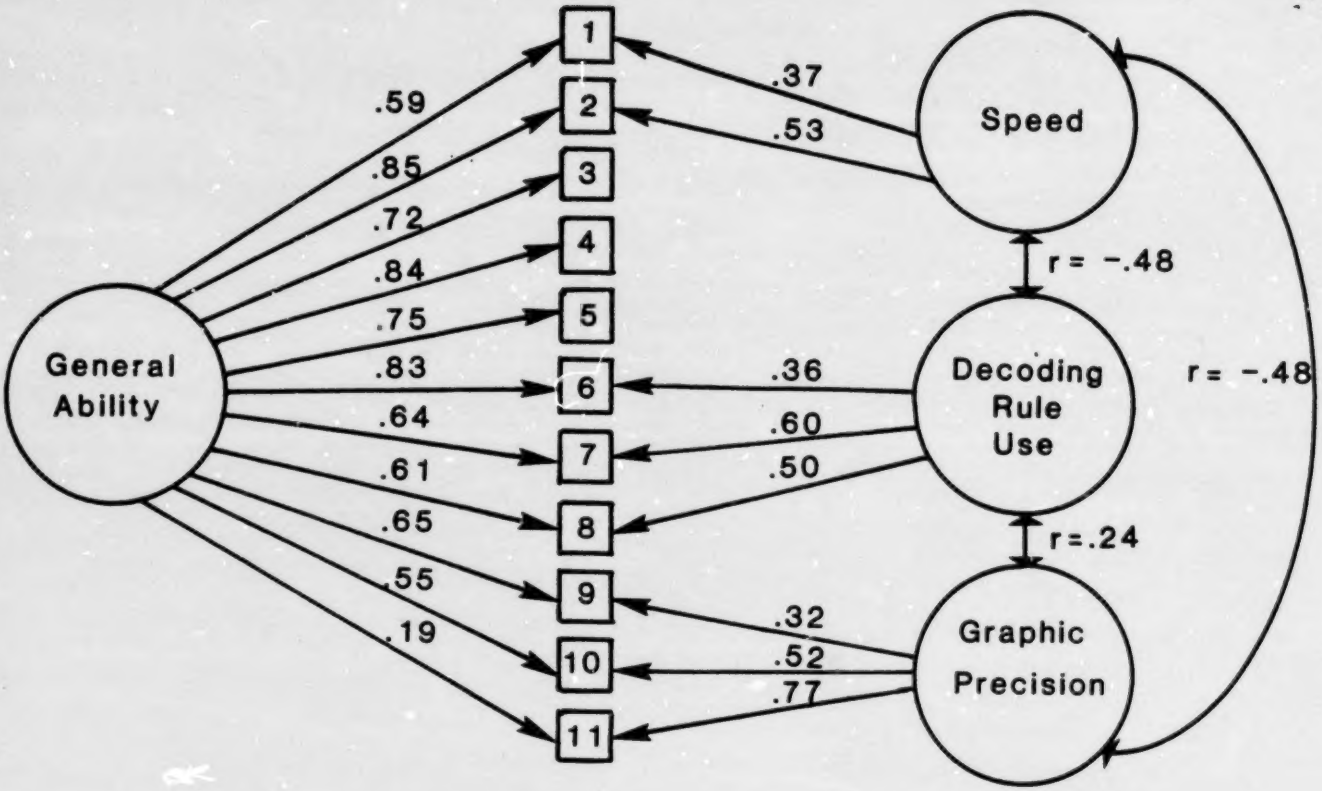


Figure 1. Mean letter, word, and text reading times of precocious readers, second graders (ages 90 or 96 months) and third graders (ages 102 or 108 months).

From N.E. Jackson & A.J. Biemiller, Letter, word, and text reading times of precocious and average readers. Manuscript under editorial review.



= latent trait

= observed measure

N = 87

χ^2(34 df)=33.6 (p=.49)

Goodness of fit index=.907

Root mean square residual=.038

Number	Description of measure	δ Error
1	Speed reading Biemiller word list	.51
2	Speed reading 4 text passages	.00
3	Accuracy, 2 cloze passages	.49
4	Contextual constraint of errors, text passages	.29
5	Accuracy, Baron irregular words	.44
6	Accuracy, Baron regular words	.19
7	Accuracy by regular rule, Baron pseudowords	.23
8	Accuracy, Woodcock-Johnson pseudowords	.38
9	Graphic constraint of errors, text passages	.48
10	Absence of omission errors, text passages	.42
11	Absence of insertion errors, text passages	.37

Figure 2. Factorial structure of precocious reading ability (LISREL V solution, Joreskog & Sorbom, 1981)